Proton Plan PMG

Baseline Proposal

And

Cost and Schedule Status
September 2005

Jeff Sims

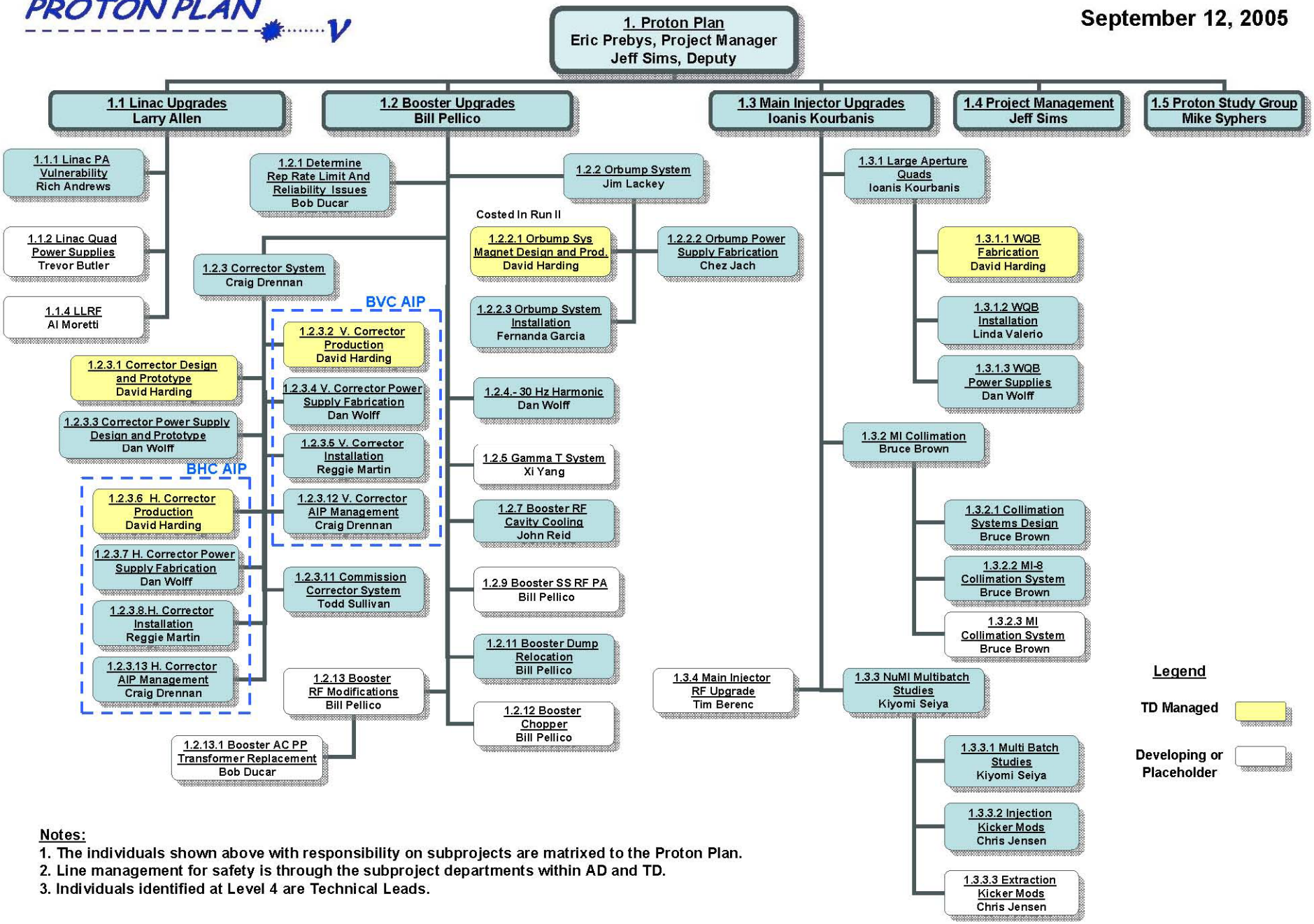
Baseline Proposal

- With the PMG's concurrence we propose the Proton Plan baseline be established based on the RLS of 9/20/05.
  - This RLS includes improvements as a result of the Director's Review of 8/05.
  - Final changes to RLS involved revising shutdown assumptions:
    - FY06 Shutdown – 9 weeks starting March 13, 2006
    - FY07 Shutdown - 8 weeks starting June 4, 2007
    - FY08 Shutdown – 8 weeks starting June 2, 2008
- Proton Plan Proposed Baseline RLS Summary:
  - Duration = 52 months from 10/1/04
  - Escalated SWF = $8,120k
  - Escalated SWF Contingency = $4,029k (50%)
  - Escalated M&S = $10,002k
  - Escalated M&S Contingency = $5,213k (52%)
  - Total Project Cost = **$27,365k**
- We have an approved Project Management Plan

Organizational Chart by WBS

PROTON PLAN V

September 12, 2005

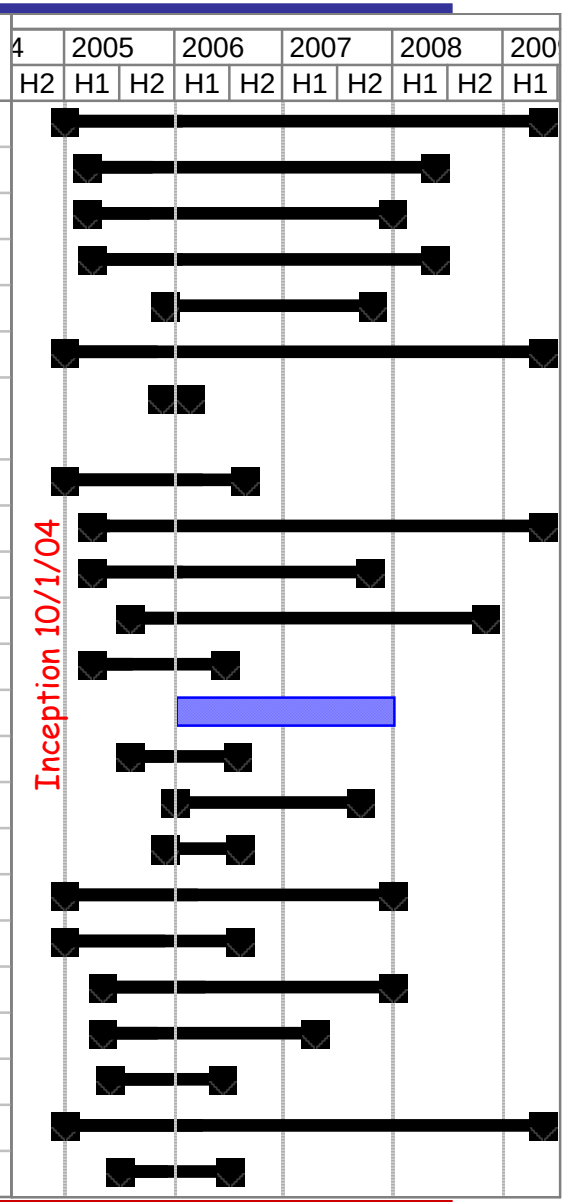


Notes:

1. The individuals shown above with responsibility on subprojects are matrixed to the Proton Plan.
2. Line management for safety is through the subproject departments within AD and TD.
3. Individuals identified at Level 4 are Technical Leads.

Proton Plan Schedule
Level 3 Summary

WBS	Name	Start	Finish
1	Proton Plan	Thu 9/30/04	Fri 2/13/09
1.1	Linac Upgrades	Wed 12/15/04	Tue 2/19/08
1.1.1	Linac PA Vulnerability	Wed 12/15/04	Fri 9/28/07
1.1.2	Linac Quad Power Supplies	Mon 1/3/05	Tue 2/19/08
1.1.4	200 Mhz LLRF Upgrade	Thu 9/1/05	Fri 7/27/07
1.2	Booster Upgrades	Thu 9/30/04	Mon 2/9/09
1.2.1	Booster RF Duty Cycle Limits & Means of Improving Booster RF Reliability for 9Hz	Mon 8/22/05	Wed 11/23/05
1.2.2	OrBump System	Thu 9/30/04	Fri 5/26/06
1.2.3	Corrector System	Tue 1/4/05	Mon 2/9/09
1.2.4	30 Hz Harmonic	Mon 1/3/05	Mon 7/16/07
1.2.5	Gamma-t System	Mon 5/2/05	Wed 8/6/08
1.2.7	Booster RF Cavity Cooling	Tue 1/4/05	Fri 3/17/06
1.2.9	Booster Solid State RF Upgrade	Mon 10/3/05	Fri 9/28/07
1.2.11	Booster Dump Relocation	Mon 5/2/05	Tue 4/25/06
1.2.12	Booster Chopper	Mon 10/3/05	Mon 6/11/07
1.2.13	Booster RF Reliability Improvements	Thu 9/1/05	Fri 5/5/06
1.3	Main Injector Upgrades	Thu 9/30/04	Wed 9/26/07
1.3.1	Large Aperture Quads - WQB	Thu 9/30/04	Tue 5/9/06
1.3.2	Collimation Systems	Tue 2/1/05	Wed 9/26/07
1.3.3	NuMI Multibatch Operation	Mon 2/7/05	Tue 1/9/07
1.3.4	Main Injector RF Upgrade	Tue 3/1/05	Mon 3/6/06
1.4	Management	Fri 10/1/04	Fri 2/13/09
1.5	Proton Study Group	Fri 4/1/05	Fri 3/31/06



PROTON PLAN

Proton Plan Costs
Level 3 Summary

WBS	Name	M&S Escalated, K	SWF Escalated, K	M&S & SWF Escalated, K	M&S Cont. %	SWF Cont. %	M&S W/ Cont., K	SWF W/ Cont. K	M&S & SWF Esc.+ Cont, K
1	**Proton Plan**	**$10,002**	**$8,121**	**$18,123**	**52%**	**50%**	**$15,216**	**$12,150**	**$27,365**
1.1	**Linac Upgrades**	**$3,372**	**$1,375**	**$4,747**	**56%**	**92%**	**$5,270**	**$2,646**	**$7,916**
1.1.1	Linac PA Vulnerability	$3,052	$592	$3,643	52%	93%	$4,631	$1,140	$5,771
1.1.2	Linac Quad Power Supplies	$189	$227	$415	99%	74%	$375	$394	$769
1.1.4	200 Mhz LLRF	$131	$556	$688	100%	100%	$263	$1,113	$1,376
1.2	**Booster Upgrades**	**$5,187**	**$3,309**	**$8,497**	**48%**	**45%**	**$7,682**	**$4,807**	**$12,488**
1.2.1	Booster RF Duty Cycle Limits	$1	$35	$36	30%	29%	$1	$45	$46
1.2.2	OrBump System	$139	$199	$338	25%	31%	$174	$261	$435
1.2.3	Corrector System	$2,782	$2,007	$4,789	46%	43%	$4,051	$2,864	$6,915
1.2.4	30 Hz Harmonic	$1,108	$685	$1,793	40%	40%	$1,551	$959	$2,510
1.2.5	Gamma-t System	$205	$152	$357	100%	100%	$410	$303	$714
1.2.7	Booster RF Cavity Cooling	$3	$6	$9	40%	28%	$4	$8	$12
1.2.9	Booster SS RF Upgrade	$0	$0	$0	0%	0%	$0	$0	$0
1.2.11	Booster Dump Relocation	$287	$127	$414	25%	34%	$357	$170	$527
1.2.12	Booster Chopper	$169	$70	$239	100%	100%	$339	$140	$479
1.2.13	Booster RF Reliability Improvements	$493	$29	$522	61%	98%	$794	$57	$851
1.3	**Main Injector Upgrades**	**$1,428**	**$1,744**	**$3,172**	**57%**	**43%**	**$2,245**	**$2,497**	**$4,742**
1.3.1	Large Aperture Quads	$435	$944	$1,379	21%	27%	$525	$1,197	$1,722
1.3.2	Main Injector Collimation System	$632	$402	$1,035	87%	83%	$1,180	$735	$1,915
1.3.3	NuMI Multibatch Operation	$359	$376	$735	50%	43%	$538	$537	$1,075
1.3.4	Main Injector RF Upgrade	$2	$21	$23	0%	34%	$2	$28	$30
1.4	**Management**	**$15**	**$1,681**	**$1,696**	**30%**	**30%**	**$20**	**$2,186**	**$2,205**
1.5	**Proton Plan Phase I Study**	**$0**	**$11**	**$11**	**0%**	**30%**	**$0**	**$15**	**$15**

* Orbump Magnet costs are collected in Run II

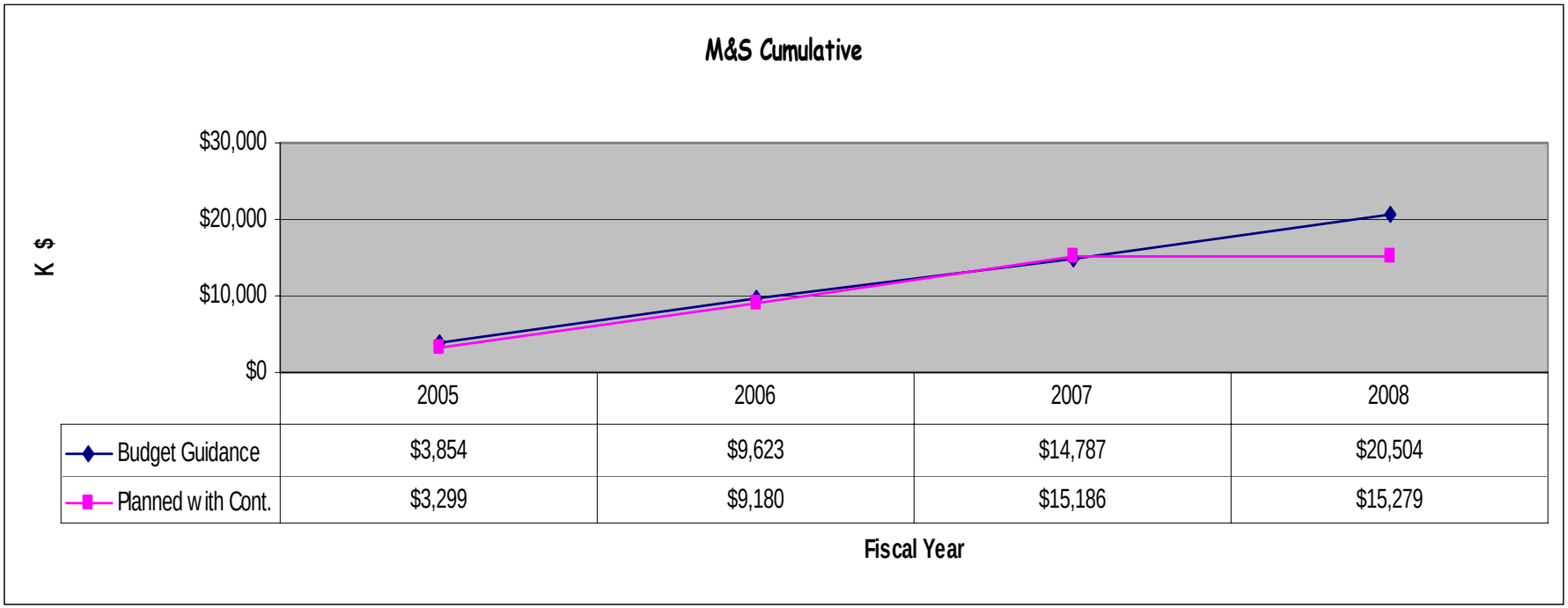
Costs by Fiscal Year

Proton Plan	FY05	FY06	FY07	FY08	FY09	Total
Escalated SWF	$1,756	$3,175	$2,501	$498	$191	$8,121
Escalated SWF Contingency	$479	$1,832	$1,500	$177	$41	$4,029
Escalated M&S	$2,807	$3,680	$3,449	$66	$0	$10,002
Escalated M&S Contingency	$429	$2,201	$2,557	$27	$0	$5,213
Total	$5,471	$10,887	$10,007	$768	$232	$27,365

AIPs only (VBC, HBC, MI Collim.)	FY05	FY06	FY07	FY08	FY09	Total
Escalated SWF	$0	$327	$986	$76	$0	$1,389
Escalated SWF Contingency	$0	$155	$490	$30	$0	$676
Escalated M&S	$0	$1,823	$567 *	$66	$0	$2,456
Escalated M&S Contingency	$0	$810	$309	$27	$0	$1,145
Total	$0	$3,115	$2,352	$199	$0	$5,666

*We plan to move approximately $500k of M&S budget for corrector fabrication from FY07 to FY06 to allow TD to issue one coil winding procurement.

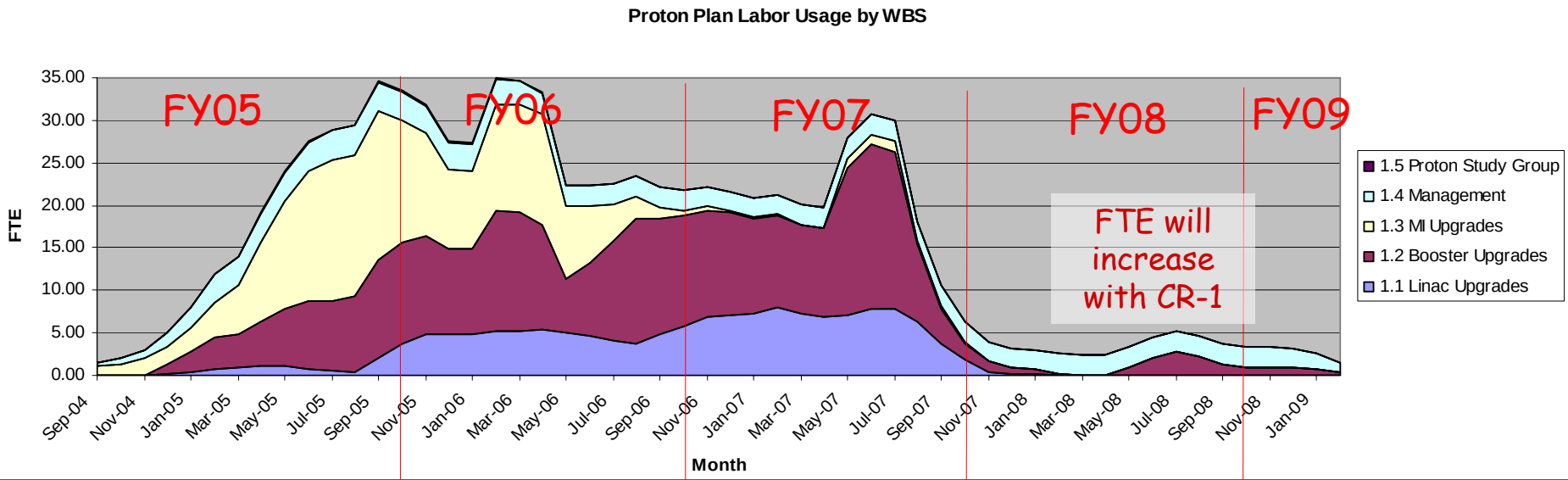
M&S - Planned vs Budget Guidance

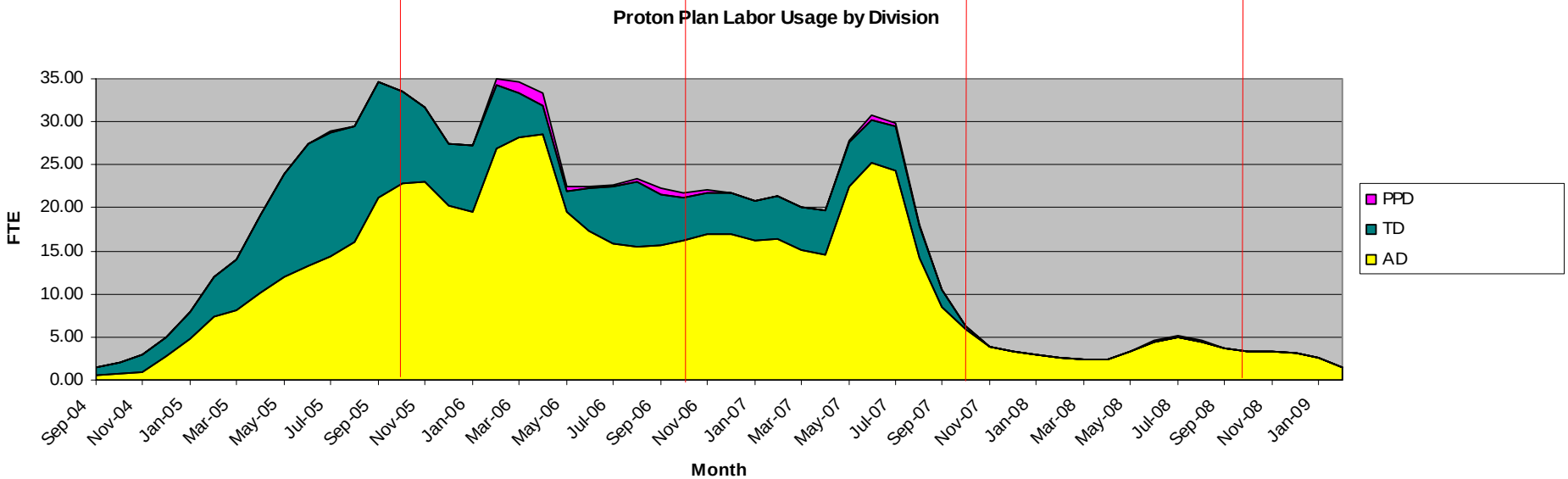


FY06 Proton Plan M&S in $K :

FY06 Guidance	5,769
FY05 Carry Forward	1,830
FY05 "Pay Back" - TD Work	(320)
FY06 Available M&S Funds	**7,279**
FY05 Planned Obligations	(4,013)
Proposed AD Held Working Contingency	(266)
Directorate-held Contingency	**3,000**

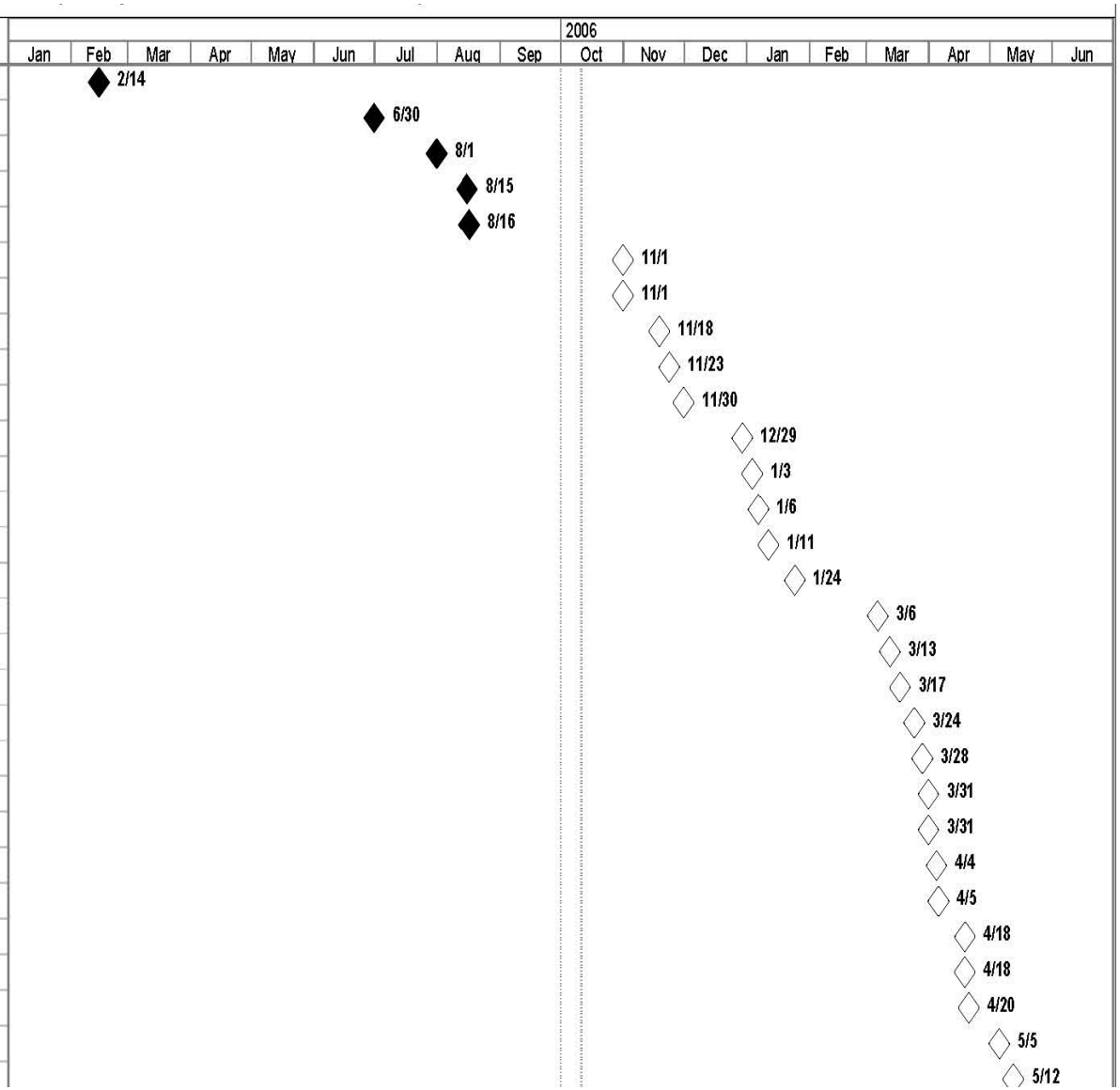
Labor Profiles





Milestones to Mid 2006

WBS	Name	MS Class	Date
1.1.1.1.2	Linac Task Force Phase 1 Report Issued	C	2/14/05
1.1.1.1.4	Linac Task Force Phase 2 Report Issued	C	6/30/05
1.1.2.1.6	Linac Quad PS Project Decision	C	8/1/05
1.3.1.1.3	WQB Design Complete	C	8/15/05
1.3.4.1.1.3	MI RF Cavity Prototype Decision	C	8/16/05
1.5.2	Submit Preliminary Proton Study Group Report	C	11/1/05
1.5.3	Submit Final Proton Study Group Report	C	11/1/05
1.2.2.1.2.6	OrBump Magnets Ready for Install on Girder	B	11/18/05
1.2.2.1.3.4	OrBump Stripline Assy Complete	B	11/23/05
1.3.1.3.4	WQB P.S. Ready for Installation	B	11/30/05
1.2.5.1.2	Gamma-t Studies Complete	C	12/29/05
1.2.4.1.4	30 Hz Harmonic Project Decision	C	1/3/06
1.2.2.2.12	OrBump Power Supply Ready for Installation	B	1/6/06
1.2.2.1.4.5	OrBump Girder Assy Complete	B	1/11/06
1.3.1.1.6.4	WQB Ready for Installation	B	1/24/06
1.3.4.2.2	MI RF Scope Decision	C	3/6/06
1.4.4	**Start 2006 Shutdown**	**C**	**3/13/06**
1.2.7.1.3	Flex Tube Installation Complete	A	3/17/06
1.3.3.1.4.1.4	Barrier Bucket Cavity Installation Complete	A	3/24/06
1.2.11.5.15	Booster Dump Relocation Installation Complete	A	3/28/06
1.3.1.3.6	WQB P.S. Installation Complete	B	3/31/06
1.3.2.2.4	MI-8 Collimators Installation Complete	A	3/31/06
1.2.13.1.4	Booster AC Pulsed Transformer Installation Complet	B	4/4/06
1.3.3.2.2.3	Injection Kicker Mod Ready for Installation	C	4/5/06
1.3.1.2.4	WQB Align/Install Complete	B	4/18/06
1.3.1.3.7	WQBs System Installed	A	4/18/06
1.2.2.3.1.5	OrBump System Installation Complete	A	4/20/06
1.3.3.2.3.5	Injection Kicker Mods Complete	B	5/5/06
1.4.5	**Finish 2006 Shutdown**	**C**	**5/12/06**



Project Reviews to Mid 2006

WBS	Name	Start	Finish	%
1.3.2.1.2.2	Review Concept for MI-8 Collimation System	6/7/05	6/7/05	100%
1.2.2.2.4	OrBump P.S. Design Review	6/15/05	6/15/05	100%
1.2.11.2	Review Booster Dump Relocation Design	7/5/05	7/5/05	100%
1.1.2.1.3	Linac Quad PS Conceptual Review Prototype	8/2/05	8/2/05	100%
1.2.11.4.4	Booster Dump Relocation Review Monorail Design	10/10/05	11/10/05	0%
1.2.12.2.2	Review Booster Chopper	12/2/05	12/2/05	0%
1.2.4.1.3	Review 30 Hz Harmonic Concept	1/3/06	1/3/06	0%
1.2.5.1.3	Gamma-t Review/Project Decision	1/3/06	1/3/06	0%
1.3.2.1.3.2	Review Concept for MI Collimation System	2/2/06	2/2/06	0%
1.1.4.1.3	200 Mhz LLRF Design Review	2/7/06	2/7/06	0%

Baseline Proposal Summary

- We have established a project team and organization and have worked well together for the last year.
- We have an approved PMP that outlines our management approach.
- We have a resource loaded schedule that represents the latest understanding of resource estimates including a reasonable contingency.
- We feel we have sufficient float in our schedule.
- The RLS contains adequate project milestones and reviews.
- Change control procedures are now being utilized.
- We have ES&H support – Mike Andrews
- Ongoing PM work includes:
  - Expansion of the Design Handbook
  - Developing a milestone dictionary
  - Periodic reviews of labor resource needs by AD and TD departments
  - What if/Risk analyses of shutdown schedule slippage
  - Fully scoping all developing and placeholder tasks

Cost and Schedule Update for September 2005

M&S Obligation

M&S Spending by Obligation In $K		Planned			ITD Costs		% Used		
		Estimate					ITD	ITD	ITD Obl+RIP
		Thru 9/05	FY05	Total	Obl.	Obl+RIP	/Sept Est	/FY05 Est	/Total Est
1	**Proton Plan**	**2,666.3**	**2,666.5**	**10,002.2**	**2,339.4**	**2,339.4**	**88%**	**88%**	**23%**
1.1	**Linac Upgrades**	**1,471.0**	**1,471.0**	**3,371.8**	**1,465.2**	**1,465.2**	**100%**	**100%**	**43%**
1.1.1	Linac PA Vulnerability	1,469.0	1,469.0	3,051.6	1,463.6	1,463.6	100%	100%	48%
1.1.2	Linac Quad Power Supply	2.0	2.0	188.7	1.6	1.6	78%	78%	1%
1.1.4	LLRF	0.0	0.0	131.5	0.0	0.0	0%	0%	0%
1.2	**Booster Upgrades**	**470.9**	**470.9**	**5,187.1**	**247.0**	**247.0**	**52%**	**52%**	**5%**
1.2.1	Determine Rep Rate Limit	0.8	0.8	0.8	0.0	0.0	0%	0%	0%
1.2.2	Orbump System	130.0	130.0	138.6	124.5	124.5	96%	96%	90%
1.2.3	Corrector System	50.0	50.0	2,781.7	20.7	20.7	41%	41%	1%
1.2.4	30 Hz Harmonic	50.0	50.0	1,108.0	24.9	24.9	50%	50%	2%
1.2.5	Gamma T System	0.0	0.0	205.2	0.0	0.0	0%	0%	0%
1.2.7	Drift Tube Cooling	3.0	3.0	3.0	0.0	0.0	0%	0%	0%
1.2.9	Booster SS RF Upgrade	0.0	0.0	0.0	0.0	0.0	0%	0%	0%
1.2.11	Booster Dump Relocation	167.0	167.0	287.0	76.8	76.8	46%	46%	27%
1.2.12	Booster Chopper	0.0	0.0	169.3	0.0	0.0	0%	0%	0%
1.2.13	Booster RF Modifications	70.1	70.1	493.5	0.0	0.0	0%	0%	0%
1.3	**Main Injector Upgrades**	**709.5**	**709.6**	**1,428.4**	**622.8**	**622.8**	**88%**	**88%**	**44%**
1.3.1	Large Aperature Quads	358.2	358.2	435.1	362.2	362.2	101%	101%	83%
1.3.2	MI Collimation System	208.4	208.4	632.3	175.6	175.6	84%	84%	28%
1.3.3	NuMI Multibatch Operation	141.0	141.0	358.9	83.4	83.4	59%	59%	23%
1.3.4	MI RF Upgrade	1.9	2.0	2.0	1.7	1.7	88%	83%	83%
1.4	**Management**	**15.0**	**15.0**	**15.0**	**4.4**	**4.4**	**30%**	**30%**	**30%**
1.5	**Proton Study Group**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**

Note: RIPS are not included - End of FY

Effort for September '05

WBS	WBS Name	Actual FTE	Plan FTE
1	**Proton Plan**	**24.6**	**31.1**
1.1	Linac Upgrades	0.6	1.0
1.2	Booster Upgrades	5.7	10.8
1.3	Main Injector Upgrades	15.9	15.8
1.4	Project Management	2.4	3.4
1.5	Proton Study Group	0.0	0.1

*

*Variance is a result of:

1. Lack of effort reporting on Corrector PS Prototyping – waiting for inductance information from TD on new corrector design.
2. Working on getting tasks in effort lists for departmental personnel to charge to. Should be resolved in October.

Upcoming Changes

- There are two change requests currently being prepared:
  - CR-1: Labor Estimate Revisions
    - Scope: This change incorporates AD MSD's latest estimate of labor required. This change also addresses Directorate Review comments on Corrector installation labor. It also includes a reduction of effort on 30Hz Harmonic.
    - SWF Increase = $130k
    - M& S Increase = $5
    - Schedule Impact = No Class A milestones impacted.
  - CR-2: WQB Magnet Fabrication M&S Increase
    - Scope: This change is required because of redesign required for the crossover bus.
    - SWF Increase = $210k
    - M& S Increase = $22k
    - Schedule Impact = Pending TD Input
- FY06 M&S obligation budget increase
  - Corrector Magnet Fabrication Procurement
    - Scope: Our intent is to be able to have sufficient available M&S to write a single fixed price subcontract to a fabricator to procure and wind the Corrector coils.
    - SWF Increase = None
    - M& S Increase = $0, only moves ~$500k obligation from FY07 to FY06
    - Schedule Impact = none

PROTON PLAN

Earned Value

		% Complete		Labor, k					M&S, k					Total, k	
				Estimate	IDT	Cost	Schedule	Estimate	IDT	Cost	Schedule			Cost	Schedule
		Planned	Actual	BCWS	BCWP	ACWP	Variance	Variance	BCWS	BCWP	ACWP	Variance	Variance	Variance	Variance
1	Proton Plan	12.8%	11.5%	1,700	1,486	1,487	-2	-214	609	604	658	-54	-5	-56	-220
1.1	**Linac Upgrades**	1.7%	1.5%	**74**	**63**	**66**	**-3**	**-11**	**7**	**7**	**2**	**5**	**0**	**3**	**-11**
1.1.1	Linac PA Vulnerability	0.2%	0.2%	4	4	1	2	0	5	5	0	5	0	**7**	**0**
1.1.2	Linac Quad Power Supply	14.8%	14.8%	60	60	65	-5	0	2	2	2	0	0	**-5**	**0**
1.1.4	LLRF	1.6%	0.0%	11	0	0	0	-11	0	0	0	0	0	**0**	**-11**
1.2	**Booster Upgrades**	8.0%	6.3%	**439**	**359**	**336**	**23**	**-81**	**239**	**193**	**166**	**27**	**-46**	**49**	**-126**
1.2.1	Determine Rep Rate Limit	41.3%	5.4%	15	2	6	-4	-13	0	0	0	0	0	**-4**	**-13**
1.2.2	Orbump System	69.0%	61.7%	113	92	131	-38	-21	130	125	125	0	-5	**-38**	**-26**
1.2.3	Corrector System	3.2%	2.4%	126	101	129	-28	-25	35	16	15	0	-19	**-28**	**-44**
1.2.4	30 Hz Harmonic	5.9%	5.2%	66	55	54	1	-11	30	30	11	19	0	**20**	**-11**
1.2.5	Gamma T System	5.8%	2.3%	28	28	0	28	0	0	0	0	0	0	**28**	**0**
1.2.7	Drift Tube Cooling	57.5%	31.2%	2	2	0	2	0	0	0	0	0	0	**2**	**0**
1.2.9	Booster SS RF Upgrade	0.0%	0.0%	0	0	0	0	0	0	0	0	0	0	**0**	**0**
1.2.11	Booster Dump Relocation	25.9%	17.0%	81	59	16	43	-22	44	22	16	7	-21	**50**	**-43**
1.2.12	Booster Chopper	0.0%	0.0%	0	0	0	0	0	0	0	0	0	0	**0**	**0**
1.2.13	Booster RF Modifications	2.3%	4.9%	9	19	0	19	10	0	0	0	0	0	**19**	**10**
1.3	**Main Injector Upgrades**	37.0%	34.3%	**776**	**653**	**809**	**-156**	**-122**	**361**	**401**	**486**	**-85**	**40**	**-240**	**-82**
1.3.1	Large Aperature Quads	67.0%	65.2%	635	569	724	-155	-66	291	332	338	-6	41	**-161**	**-25**
1.3.2	MI Collimation System	9.0%	5.7%	80	51	72	-21	-29	3	2	71	-69	-1	**-90**	**-30**
1.3.3	NuMI Multibatch Operation	16.0%	12.4%	54	27	4	23	-27	65	65	75	-10	0	**13**	**-27**
1.3.4	MI RF Upgrade	34.1%	34.1%	6	6	8	-2	0	2	2	2	0	0	**-2**	**0**
1.4	**Management**	24.0%	24.0%	**405**	**405**	**277**	**128**	**0**	**3**	**3**	**4**	**-2**	**0**	**126**	**0**
1.5	**Proton Study Group**	50.1%	50.0%	**6**	**6**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**

EV Analysis

- M&S Cost Variance and Schedule Variance are reasonable.
- Labor Cost Variance and Schedule Variance are high in areas:
  - Cost Variance seems reasonable at a high level. However labor CV on 1.2.2 (Orbump) and 1.3.1 (WQB) seems significant.
    - CR-1 will correct the Labor CV on 1.2.2
    - CR-2 will correct the Labor CV on 1.3.1
  - Schedule Variance is significant on 1.1.4 (LLRF), 1.2.1 (Det. Rep Rate Limit), 1.2.2 (Orbump), 1.2.3 (Correctors), 1.2.11 (BDR), 1.3.1 (WQB), 1.3.2 (MI Coll), 1.3.3 (NuMI Multibatch)
    - 1.1.4 (LLRF) and 1.2.1 (Det. Rep Rate Limit) are being delayed from the lack of RF resources available due to operational issues.
    - 1.2.2 (Orbump) is being delayed because it is not as critical to complete the power supply fabrication now that the Shutdown has been postponed to early 2006.
    - 1.2.3 (Correctors) prototype power supply design has been delayed pending a new inductance specification based on the new TD design. Should have this next week.
    - 1.2.11 (BDR), Delays in Power to MP01 Septum – Location has changed in BW Tower.
    - 1.3.1 (WQB) Design change delayed progress - CR-2 will correct
    - 1.3.2 (MI Coll) Delays in simulation and radiation measurements.
    - 1.3.3 (NuMI Multibatch) Injection kicker design and prototype delays due to a lack of mechanical resources. Recently corrected.
  - Under reporting on 1.2.4(Gamma-T), 1.2.11 (BDR), 1.3.3 (NuMI Multi batch)
    - We are working to get the proper AD personnel to report effort to these subprojects.

Summary

- We have identified the current problem areas and will work with level 2 and level 3 managers to remediate them. This will be the topic of our next Proton Plan group meeting.
- We are currently utilizing the change control mechanisms set forth in the PMP.
- We anticipate automated reporting will be available in Nov/Dec 2005 timeframe.
- We have identified Rich Andrews as the coordinator of all upcoming Proton Plan shutdown related work.